



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/988,648 | 11/20/2001 | Terutsugu Gotanda | 033192-007 | 8855 |

7590 09/09/2004

Platon N. Mandros
BURNS, DOANE, SWECKER & MATHIS, L.L.P.
P.O. Box 1404
Alexandria, VA 22313-1404

EXAMINER

PATEL, KIRAN B

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

3612

DATE MAILED: 09/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/988,648

Applicant(s)

GOTANDA ET AL.

Examiner

Kiran B. Patel

Art Unit

3612

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-4, 6-10, 12-14 and 16-28 is/are pending in the application.
- 4a) Of the above claim(s) 7 and 8 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-4, 6, 9-10, 12-14 and 16-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Non-Final Rejection

Election/Restriction

1. The Applicant canceled claims 1, 5, 11, and 15.
2. Claims 7-8 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Species.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 2-4, 6, 9, 10, 12-14, 16-26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed

invention. The limitation in claims 2, 12 "includes projections and recesses which are alternately arranged in the circumferential direction of the crash box" appears to be new matter and was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 2-4, as best understood, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 2, "an initial buckling portion, which is previously formed only in a predetermined portion of the crash box that is close to one of the first and second ends" fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not understood what is meant by "previously formed only in a predetermined portion of the crash box". It is not clear what is claimed by "close to one of the first and second ends".

Regarding claim 2, "the initial buckling portion being a plastically deformed portion formed by applying an axial load to material forming the crash box before the vehicle bumper is mounted on the vehicle" fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 12, "the initial buckling portion being formed by plastic deformation of a part of the crash box before the vehicle bumper is mounted on the vehicle" fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 12, "the plastic deformation of said part of the crash box being achieved by applying an axial load to material forming the crash box so that the plastically deformed initial buckling portion extends around the entire circumference of the crash box and includes projections and recesses" fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 12 "the entire part of the crash box in which is located the plastically deformed initial buckling portion being closer to the first end of the hollow crash box than the second end of the hollow crash box with the start of plastic deformation of the hollow crash box occurring at a specific portion of the

hollow crash box defined by the initial buckling portion and proceeding toward an adjacent portion of the hollow crash box" fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 21, "the initial buckling portion is located only at a portion of the hollow crash box that is close to the bumper reinforce" fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 24, "the crash box includes a hollow body that surrounds the at least one partition and the initial buckling portion is formed on a portion of the hollow body that surrounds the at least one partition" fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It appears that the whole cross section, also to include the partition, will have to buckle.

Regarding claim 27, "the hollow crash box including an initial buckling portion at which plastic deformation of the hollow crash box starts when the crash box receives a load, the initial buckling portion being formed by plastic deformation of a part of the crash box before the vehicle bumper is mounted on the vehicle, the plastic deformation of said part of the crash box being achieved by applying an

axial load to material forming the crash box so that the plastically deformed initial buckling portion extends around the entire periphery of the hollow body and is formed on a portion of the hollow body in which is located the partition" fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It appears that the whole cross section, also to include the partition, will have to buckle. The partition is through the whole length of the crash box and does it mean the initially deformed portion extends over the entire length of the box?

Regarding claim 28, "at least one partition comprises two partitions in the interior of the hollow body" is not clear and fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

2. Claims, elected for prosecution, are confusing and are not clear because claimed limitations, (claim 2, the initial buckling portion extends along the entire circumference of the predetermined portion in the axial direction of the crash box and includes projection and recesses which are alternately arranged in the circumferential direction of the crash box (new matter); claim 6, the crash box is one of a pair of crash boxes, each of which is located at one end of the bumper

reinforce; claim 12, projections and recesses which are alternatively arranged in the circumferential direction of the crash box (new matter); claim 12, the entire part of the crash box in which is located the plastically deformed initial buckling portion being closer to the first end of the hollow crash box than the second end of the hollow crash box with the start of plastic deformation of the hollow crash box occurring at a specific portion of the hollow crash box defined by the initial buckling portion and processing toward an adjacent portion of the hollow crash box; claim 21, the initial buckling portion is located only at a portion of the hollow crash box that is close to the bumper reinforce; claim 24, the crash box includes a hollow body that surrounds the at least one partition and the initial buckling portion is formed on a portion of the hollow body that surrounds the at least one partition; claim 27, the initial buckling portion being formed by plastic deformation of a part of the crash box before the vehicle bumper is mounted on the vehicle, the plastic deformation of said part of the crash box being achieved by applying an axial load to material forming the crash box so that the plastically deformed initial buckling portion extends around the entire periphery of the hollow body and is formed on a portion of the hollow body in which is located the partition; claim 28, at least one partition comprises two partitions in the interior of the hollow body),

are not shown in the figures and/or lacks support in the specification and therefore fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention. These limitations must be shown or the feature(s) canceled from the claim(s). Applicant is requested to go through the application and ensure that the claimed matter has been described in the specification and shown in the drawing in such a way as to convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 2-4, 6, 9, 10, 12-14, 16-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Motozawa et al. (6,203,098) in view of Myers (3,831,997).

Regarding Claims 2-4, 6, 9, 10, 12-14, 16-26, Motozawa et al. (6,203,098) discloses in Fig. 1-12 the invention as claimed to include a lateral bumper reinforce 10; a pair of front-rear hollow crash boxes 8 with (plastically deformed) portion 9

and having constant rectangular cross-section, sides, ridgelines and two ends; a vehicle body 7; and plurality of partitions Fig 3.

However, Motozawa et al. (6,203,098) does not disclose an initial buckling portion extends around the entire circumference and includes projections and recesses which are alternatively arranged in the circumferential direction of the crash box (new matter and specification lacks supports for this limitation).

Myers (3,831,997) discloses in Fig 1-2 an initial buckling portion 21 extends around the entire circumference and includes projections and recesses which are alternatively arranged in the circumferential direction of the crash box.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention, as disclosed by Motozawa et al. (6,203,098), to include an initial buckling portion extends around the entire circumference and includes projections and recess which are alternatively arranged in the circumferential direction of the crash box, as disclosed by Myers (3,831,997), to cost effectively manufacture the crash box to absorb the desire level of shock.

2. Claims 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Motozawa et al. (6,203,098) in view of Japan (07-145843).

Regarding Claims 27-28, Motozawa et al. (6,203,098) discloses in Fig. 1-12 the invention as claimed to include a lateral bumper reinforce 10; a pair of front-rear hollow crash boxes 8 with (plastically deformed) portion 9 and having two ends; a vehicle body 7; and plurality of axial partitions Fig 3.

However, Motozawa et al. (6,203,098) does not disclose an initial buckling portion extends around the entire periphery of the hollow body and is formed on a portion of hollow body in which is located the partition.

Japan (07-145843) discloses in Fig 1-2 an initial buckling portion "A" extends around the entire periphery of the hollow body and is formed on a portion of hollow body in which is located the partition.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention, as disclosed by Motozawa et al. (6,203,098), to include an initial buckling portion extends around the entire periphery of the hollow body and is formed on a portion of hollow body in which is located the partition, as disclosed by Japan (07-145843), to cost effectively manufacture the crash box to absorb the desire level of shock.

Response to Arguments

Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Plastic deformation - For most metallic material, elastic deformation persists only to strains of about 0.005. As the material is deformed beyond this point, the stress is no longer proportional to strain (Hook's Law) and permanent, nonrecoverable, or plastic deformation occurs. (see attached pages 1-5 from Materials Science and Engineering by Callister, Jr.)

Applicant's argument that "Motozawa et al. (6,203,098) does not describe that the stress concentration portions 9 are constituted by or formed as a plastically deformed portion" is not valid because it is well known in the art that portions 9 can only be constituted by or formed by plastically deformation applying


Hook's Law. Non plastic deformation will revert to the original shape once the deformation load is removed i.e. if the portions 9 would have been resulted by applying a force within non plastic deformation (Hook's Law) then portions 9 would not exists as soon as the deformation load is removed. Also, if the portions 9 would have been resulted by applying a force within plastic deformation (Hook's Law) then portions 9 would exists even after the deformation load is removed.

Applicant's argument "However, that the stress concentration portions 9 could be fabricated as a plastic deformation portion is not particularly relevant" is not clear and because Applicant argues and have claimed, "plastically deformed" in every claim.

Applicant's argument "the corrugations 21 do not define projections and recesses which are alternately arranged in the circumferential direction" is not valid. First, "are alternately arranged in the circumferential direction" appears to be new matter and lacks support in the specification. Second, Examiner respectfully disagrees with the Applicant where Applicant argues that corrugations 21 do not define projections and recesses.

Conclusion

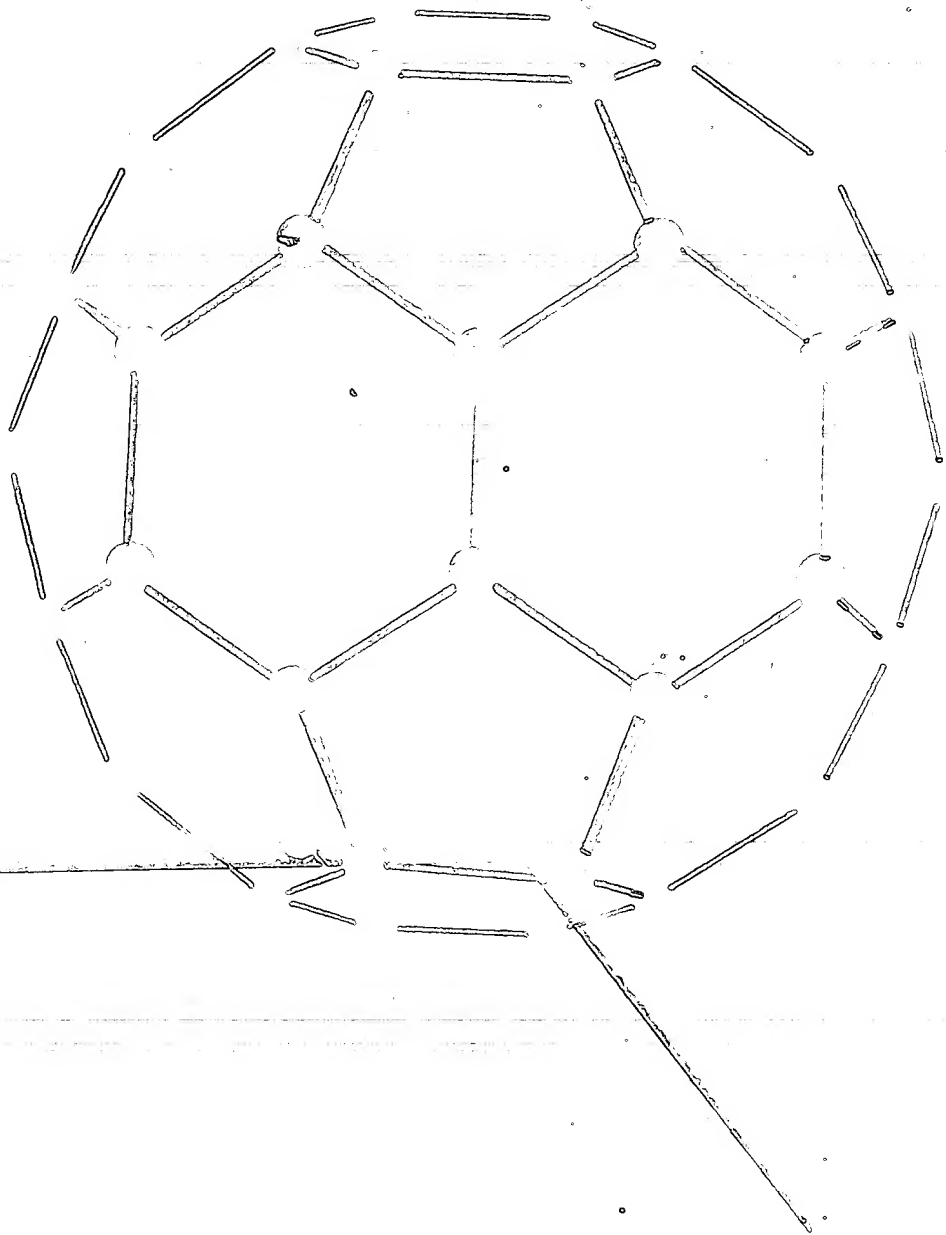
3. Any inquiry concerning this communication or earlier communications should be directed to Primary Examiner Kiran B. Patel whose telephone number is 703-305-0254. The examiner can normally be reached on M-F from 8:00 to 5:00. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.


Kiran B. Patel, P. E.
Primary Examiner
Art Unit 3612
September 4, 2004

WILLIAM D. CALLISTER, Jr.

MATERIALS SCIENCE AND ENGINEERING

AN INTRODUCTION



MATERIALS SCIENCE AND ENGINEERING

An Introduction

THIRD EDITION

WILLIAM D. CALLISTER, Jr.

Department of Materials Science and Engineering
The University of Utah



JOHN WILEY & SONS, INC.

New York

Chichester

Brisbane

Toronto

Singapore

Front Cover: The hollow sphere-like object on the front cover represents the geometry assumed by a molecule of a newly discovered form of carbon. The molecule consists of sixty carbon atoms (denoted as C_{60}) that are bonded to one another at the corners of interlocking hexagons and pentagons that circumscribe the sphere. The material composed of the C_{60} molecules is known as *buckminsterfullerene*, named in honor of R. Buckminster Fuller who invented the geodesic dome; the C_{60} molecule is a replica of this dome, which is often referred to as a "buckyball." The class of materials that are composed of these C_{60} molecules are termed the fullerenes. (Permission to use this figure was granted by Jerzy Bernholc, North Carolina State University.)

Back Cover: On the back cover is shown three smaller and hollow ball-like shapes which represent other configurations that have also been observed for molecular carbon. These molecules are composed of fewer than 60 carbons atoms, are less stable than the C_{60} molecule, and have outer surfaces that are also composed of interlocking hexagons and pentagons. The term "buckybabies" has been applied to these molecules inasmuch as they are smaller than the C_{60} buckyball. (Permission to use this figure was granted by Richard E. Smalley, Rice University.)

COVER Painting by Roy Wiemann
ACQUISITIONS EDITOR Cliff Robichaud
MARKETING MANAGER Susan Elbe
PRODUCTION EDITOR Nancy Prinz
DESIGN SUPERVISOR Ann Marie Renzi
MANUFACTURING MANAGER Susan Stetzer
ILLUSTRATION Anna Melhorn, Rosa Bryant
TEXT DESIGN Laura Ierardi

This book was set in Times Roman by Bi-Comp, Incorporated and printed and bound by R. R. Donnelley & Sons Company. The cover was printed by Phoenix Color Corp.

Recognizing the importance of preserving what has been written, it is a policy of John Wiley & Sons, Inc. to have books of enduring value published in the United States printed on acid-free paper, and we exert our best efforts to that end.

Copyright © 1985, 1991, and 1994, by John Wiley & Sons, Inc.

All rights reserved. Published simultaneously in Canada.

Reproduction or translation of any part of this work beyond that permitted by Sections 107 and 108 of the 1976 United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the Permissions Department, John Wiley & Sons, Inc.

Library of Congress Cataloging in Publication Data:

Callister, William D., 1940—

Materials science and engineering: an introduction/William D.

Callister, Jr.—3rd ed.

p. cm.

Includes bibliographical references and index.

ISBN 0-471-58128-3 (cloth)

1. Materials. I. Title.

TA403.C23 1994

620.1'1—dc20

93-28301

CIP

Printed in the United States of America

10 9 8 7 6 5 4 3

It next becomes necessary to calculate the strain in the z direction using Equation 6.7. The value for Poisson's ratio for brass is 0.35 (Table 6.1), and thus

$$\epsilon_z = -\frac{\epsilon_x}{\nu} = -\frac{(-2.5 \times 10^{-4})}{0.35} = 7.14 \times 10^{-4}$$

The applied stress may now be computed using Equation 6.4 and the modulus of elasticity, given in Table 6.1 as 14.6×10^6 psi (10.1×10^4 MPa), as

$$\sigma = \epsilon_z E = (7.14 \times 10^{-4})(14.6 \times 10^6 \text{ psi}) = 10,400 \text{ psi}$$

Finally, from Equation 6.1, the applied force may be determined as

$$\begin{aligned} F &= \sigma A_0 = \sigma \left(\frac{d_0}{2} \right)^2 \pi \\ &= (10,400 \text{ psi}) \left(\frac{0.4 \text{ in.}}{2} \right)^2 \pi = 1310 \text{ lb}_f (5820 \text{ N}) \end{aligned}$$

■ PLASTIC DEFORMATION

For most metallic materials, elastic deformation persists only to strains of about 0.005. As the material is deformed beyond this point, the stress is no longer proportional to strain (Hooke's law, Equation 6.4, ceases to be valid), and permanent, nonrecoverable, or **plastic deformation** occurs. Figure 6.9a plots schematically the tensile stress-strain behavior into the plastic region for a typical metal. The transition from elastic to plastic is a gradual one for most metals; some

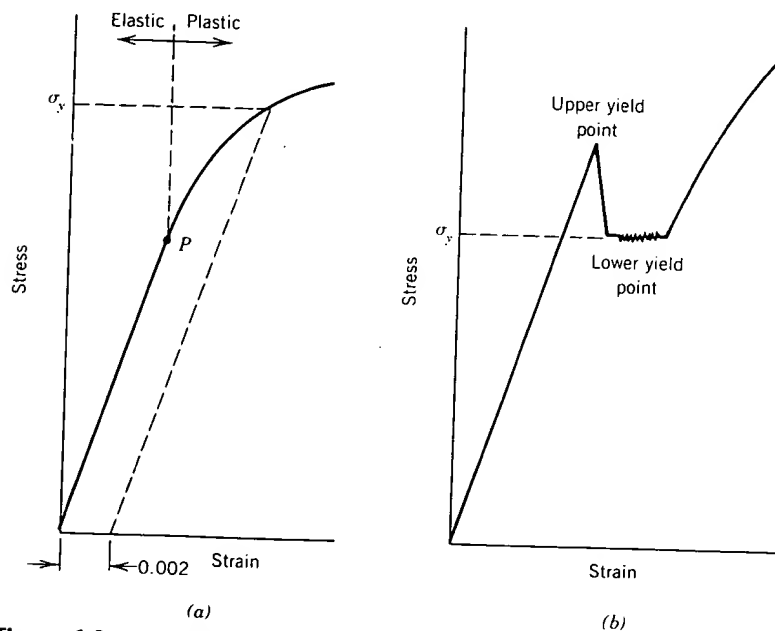


Figure 6.9 (a) Typical stress-strain behavior for a metal showing elastic and plastic deformations, the proportional limit P , and the yield strength σ_y , as determined using the 0.002 strain offset method. (b) Representative stress-strain behavior found for some steels demonstrating the yield point phenomenon.

curvature results at the onset of plastic deformation, which increases more rapidly with rising stress.

From an atomic perspective, plastic deformation corresponds to the breaking of bonds with original atom neighbors and then reforming bonds with new neighbors as large numbers of atoms or molecules move relative to one another; upon removal of the stress they do not return to their original positions. The mechanism of this deformation is different for crystalline and amorphous materials. For crystalline solids, deformation is accomplished by means of a process called slip, which involves the motion of dislocations as discussed in Section 7.2. Plastic deformation in noncrystalline solids (as well as liquids) occurs by a viscous flow mechanism, which is outlined in Section 13.9.

6.6 TENSILE PROPERTIES

Yielding and Yield Strength

Most structures are designed to ensure that only elastic deformation will result when a stress is applied. It is therefore desirable to know the stress level at which plastic deformation begins, or where the phenomenon of **yielding** occurs. For metals that experience this gradual elastic-plastic transition, the point of yielding may be determined as the initial departure from linearity of the stress-strain curve; this is sometimes called the **proportional limit**, as indicated by point *P* in Figure 6.9a. In such cases the position of this point may not be determined precisely. As a consequence, a convention has been established wherein a straight line is constructed parallel to the elastic portion of the stress-strain curve at some specified strain offset, usually 0.002. The stress corresponding to the intersection of this line and the stress-strain curve as it bends over in the plastic region is defined as the **yield strength** σ_y .² This is demonstrated in Figure 6.9a.

For those materials having a nonlinear elastic region (Figure 6.5), use of the strain offset method is not possible, and the usual practice is to define the yield strength as the stress required to produce some amount of strain (e.g., $\epsilon = 0.005$).

Some steels and other materials exhibit the tensile stress-strain behavior as shown in Figure 6.9b. The elastic-plastic transition is very well defined and occurs abruptly in what is termed a *yield point phenomenon*. At the upper yield point, plastic deformation is initiated with an actual decrease in stress. Continued deformation fluctuates slightly about some constant stress value, termed the lower yield point; stress subsequently rises with increasing strain. For metals that display this effect, the yield strength is taken as the average stress that is associated with the lower yield point, since it is well defined and relatively insensitive to the testing procedure.³ Thus, it is not necessary to employ the strain offset method for these materials.

The magnitude of the yield strength for a metal is a measure of its resistance to plastic deformation. Yield strengths may range from 5000 psi (35 MPa)

² "Strength" is used in lieu of "stress" because strength is a property of the metal, whereas stress is related to the magnitude of the applied load.

³ It should be pointed out that to observe the yield point phenomenon, a "stiff" tensile-testing apparatus must be used; by stiff is meant that there is very little elastic deformation of the machine during loading.

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☒ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.